SD-BASIC SPRAY DRYER

ASSEMBLY & OPERATING INSTRUCTIONS

1) **Introduction**
2) **Safety / COSHH**
3) **General Safety Rules**
4) **Components Included**
5) **Packing List**
6) **Connection to Electrical Supply**
7) **Assembly and Preparation**
8) **Controls**
9) **Jet Spray Assembly**
10) **Operation**
11) **General Advice and Useful Hints**
12) **Optional Accessories**
13) **Maintenance, Replacement and Spare Parts**
14) **Notes**

Last Revision :NOV 2009

1) INTRODUCTION

The SD-Basic is a simple and effective laboratory scale spray dryer for product research and development.

The SD-Basic spray dryer is designed to enable initial product trials and evaluation to be carried out quickly and efficiently.

The unit is supplied with a complete glassware set comprising main drying chamber, cyclone, sample collection and waste collection bottles, clamps, seals and all necessary tubing.

The chemically resistant housing includes the blower, heater and the controls for inlet temperature and pump speed. The drying air volume is fixed at $70m^3$/hr.

2) SAFETY IN THE USE OF EQUIPMENT SUPPLIED BY LAB-PLANT LTD

Before proceeding to install, commission or operate the equipment supplied you should be aware of potential hazards so that they may be avoided.

Although designed for safe operation, any equipment may involve processes or procedures, which are potentially hazardous. The major potential hazards associated with this particular equipment are listed below.

- INJURY THROUGH MISUSE
- INJURY FROM ELECTRIC SHOCK
- INJURY FROM HOT SURFACES
- RISK OF INFECTION THROUGH LACK OF CLEANLINESS

Accidents can be avoided provided that equipment is regularly maintained and operators are aware of potential hazards. A list of general safety rules is included in this manual. This list is intended to be for guidance only.

The COSHH Regulations (1988) - The Control of Substances Hazardous to Health

The COSHH regulations impose a duty on employers to protect employees and others from substances used at work which may be hazardous to health. The regulations require that you assess all operations which are liable to expose any person to hazardous solids, liquids, dusts, vapours, gases or micro-organisms. You are also required to introduce suitable procedures for handling these substances and to keep appropriate records.

The equipment supplied by Lab-Plant Ltd may involve the use of substances which can be hazardous (for example, cleaning fluids used for maintenance or chemicals used for particular applications) and it is essential that a person in authority is responsible for implementing COSHH regulations.

Part of these regulations is to ensure that the relevant Health and Safety Data Sheets are available for all hazardous substances used in the laboratory. Any person using a hazardous substance must be informed of the following:

- Physical Data about the substances
- Any hazard from fire or explosion
- Any hazard to health
- Appropriate First Aid treatment
- Any hazard from reaction with other substances
- How to clean/dispose of spillage
- Appropriate protective measures
- Appropriate storage and handling

Although these regulations may not be applicable in your country, it is strongly recommended that a similar approach is adopted for the protection of staff operating the equipment. Local regulations must also be considered.

3) GENERAL SAFETY RULES

a) Before attempting to install, commission or operate equipment the manufacturers instructions should be understood and implemented.

b) It is dangerous to misuse equipment or ignore instructions, regulations or warnings.

c) Do not exceed specified maximum operating conditions (e.g. temperature, pressure, speed etc.).

INSTALLATION

a) Use lifting tackle where possible to install heavy equipment.

b) Care should be exercised to avoid damage to the equipment during handling and unpacking.

c) Ensure that all services are compatible with the equipment and that independent isolators are always provided and labelled. Use reliable connections in all instances, do not improvise.

d) Ensure that all equipment is earthed and connected to an electrical supply at the correct voltage. The electrical supply must incorporate an Earth Leakage Circuit Breaker (ELCB) or Residual Current Circuit Breaker (RCCB) to protect the operator from electric shock in the event of misuse or accident.

e) Potential hazards should always be the first consideration when deciding on a suitable location for equipment. Leave sufficient space around equipment.

COMMISSIONING

1) Ensure that equipment is commissioned and checked by a competent member of staff.

4) COMPONENTS INCLUDED

The unit comprises:

Main Unit. Including control panel, inlet air filter, peristaltic pump, exhaust stack.

Glass Assembly Main drying chamber, cyclone , sample collection bottle and waste collection tube.

Stainless Steel Jet Assembly 0.5 mm jet nozzle assembly with manually operated de-blocking needle

Other Items All necessary silicone pump tubing, nylon compressed air tubing, exhaust tubing, SVL connectors, clamps and PTFE gaskets.

NOTE : **The SD-Basic requires an external compressed air supply. Minimum requirements 27 l/min@ 3 Bar. Lab-Plant offers a silent compressor as an accessory. Please see the SD-Basic price list.**

5) PACKING LIST

The apparatus should be carefully unpacked and the components checked against the Delivery Note. Any omissions or breakages should be notified to Lab-Plant Ltd within three days of receipt.

DESCRIPTION	**QTY**
Main SD-Basic unit	1
Main Chamber	1
Cyclone	1
Sample Collection Bottle	1
Waste Collection Tube	1
SVL Screw Connectors	2
PTFE Gaskets	2
Clamp for Chamber/Cyclone	1
Jet Assembly with 0.5 mm jet	1
Silicone Tube 4 . 8mm bore x 1 . 6mm wall	2.0 m
Exhaust Tube	1.7 m
Nylon Tube 6mm ∅	2.0 m

6) CONNECTION TO ELECTRICAL SUPPLY

The Lab-Plant SD-Basic Spray Dryer is supplied for 220/240V, 50/60Hz operation.

A 110/120V primary 240V secondary step up transformer is supplied for 110V operation.

The power requirement for the 240 volt unit is 13 amp and for the 110 volt unit is 30 amps.

Brown = Live
Blue = Neutral
Green/Yellow = Earth

The SD-Basic must always be connected to suitable earthing.

7) ASSEMBLY & PREPARATION

FITTING GLASSWARE.

a) The main chamber fits into the black clamp on the left hand side of the unit. Unscrew the knurled stainless nut until the clamp will open and slide the main chamber in towards the main housing with the 90° outlet of the main chamber facing right. Close the clamp and tighten the knurled stainless steel nut. Do not over tighten as this may cause damage to the glass. In addition some rotation of the main chamber may be necessary when clamping to the cyclone.

b) The cyclone fits directly into the exhaust stack on the right of the unit. Loosen the knurled cap on the end of the exhaust stack. Enter the top of the cyclone into the cap, push the cyclone upwards. There will be some resistance as the glass tube slides up through a rubber seal. The 90° inlet of the cyclone should face to the left.

c) Use the black anodised aluminium clamp to hold the main chamber and cyclone side arms together. No seal is required

d) Screw SVL connectors on to sample and waste collection bottles, place one of each of the PTFE seals into the SVL connector and then screw onto base of main chamber and cyclone.

e) Finally ensure that the glassware is held securely in place at the main chamber top clamp and the cyclone exhaust.

FITTING JET NOZZLE.

The jet nozzle assembly fits into the top of the unit and is fastened in by a threaded ring. Align the liquid inlet and compressed air inlet as required. Fit the 6mm nylon tube into the push-fitting mid way down the jet assembly. The open end of the 6 mm nylon tube must be connected to a suitable compressed air supply

The silicone tube for the liquid sample is fitted on to the grooved inlet at the top of the jet assembly. The remaining tube can be routed through the top of the main housing before fitted through the pump and the open end placed into the sample.

EXHAUST TUBING

Fit the 50 mm diameter flexible exhaust tube supplied over the exhaust outlet and direct to atmosphere or existing extraction system.

THE SD-BASIC IS NOW READY FOR USE. CONNECT TO MAINS AND PROCEED.

8) CONTROLS

The control panel includes from left to right :

Mains ON/OFF Switch

Inlet temperature controller

Outlet temperature display only

Blower ON/OFF

Pump ON/OFF

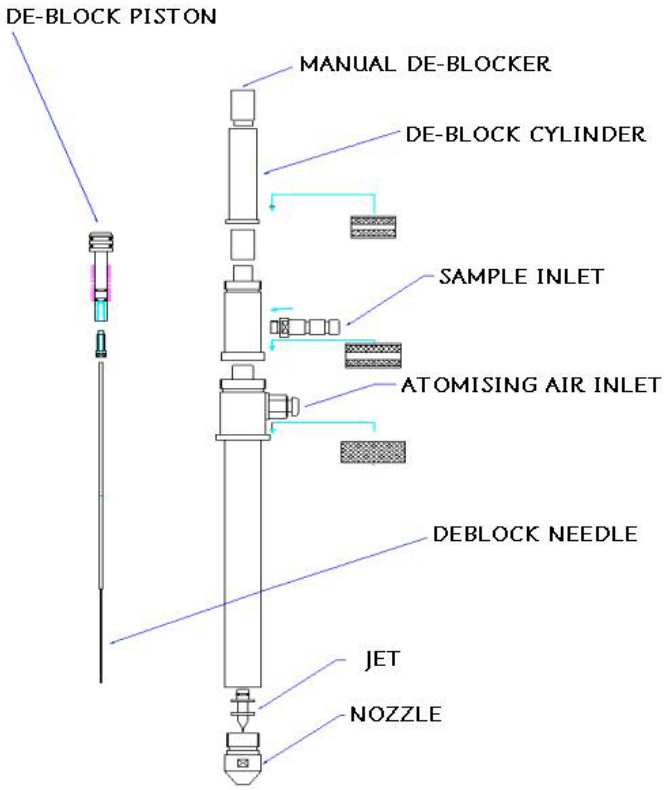
Heater ON/OFF

Pump Speed Control (Rotary Knob)

To set the inlet temperature press the * button and the ‘up’ or ‘down’ button to achieve the desired temperature. Release the buttons and the actual inlet temperature is displayed.

9) JET ASSEMBLY

The stainless steel spray assembly is a double fluid nozzle where the inner nozzle develops the liquid jet and the outer the compressed air jet. The compressed air atomises the liquid as it emerges from the jet to form the required fine spray.
The jet and outer nozzle can be unscrewed from the main assembly for cleaning as required.
Always be careful not to damage the inner jet nozzle (which is only 0.5mm ∅ thin wall stainless steel) as any slight misalignment will affect the efficiency of the spray.
The jet assembly is easy to disassemble by unscrewing the knurled rings.



Open the hinged plastic cover of the pump and leaving sufficient tube to connect to the jet when it is in the top chamber, feed the silicon tubing into the peristaltic pump.

Open the white plastic clips which retain the tube in position, insert the tube fully and release the clips. The tube should now be regularly compressed by the pump rotors. Fit one end of the tube to the sample inlet

10) OPERATION

Select the product you wish to spray dry but always start and end the process by using clean or distilled water.

Place the pump tube in the water.

Switch on the mains switch on the SD-Basic and then switch on the blower and the heater.

Note: The heater will not operate unless the blower is running.

The actual inlet temperature and outlet temperature are displayed.

A variable over temperature protection cut out is fitted and is factory set to actuate at approximately 250°c (if actuated allow to cool down and re-set the trip located in main housing above peristaltic pump)

THEN SET THE PUMP TO A SLOW RATE E.G. 5 OR 10.

Allow a small amount of water to be pumped into the silicone tube to clean the tube and the jet and then transfer the tube to the sample. When the sample reaches the jet the Spray Drying Operation should commence and dried powder should be observed spiralling down the cyclone into the collection bottle.

Once spray drying has commenced varying the parameters of temperature, air flow and pump speed, may be tried to improve the process.

11) GENERAL ADVICE AND USEFUL HINTS

1) Always start a trial with a medium inlet temperature (120-150°C) and a slow pump rate. Observe the bottom of the main chamber for wetting and either reduce the pumping rate or increase the temperature if the product is not completely drying. The optimum pumping/temperature rates are achieved when no wet spotting of the product is observed (this assumes water as the solvent)

2) If the sample is a liquid with solids in suspension it may be necessary to keep it continually agitated with a magnetic or overhead stirrer. If the sample is pumped from the bench top the product may separate as it is being pumped upwards in the silicone tube.

3) Most spray drying processes lose fines in the exhaust. The amount lost usually depends on air flow and particle weight. The particle size/weight can often be increased by using a larger jet size.

4) At the commencement of a run allow the main chamber a few minutes to heat up. The inlet temperature may show the required setting but the glassware and main chamber will be quite cool for a few minutes.(wait until inlet temperature has stabilised).

5) If the sprayed sample is light coloured it may be more easily observed by placing a dark card behind the cyclone.

6) The ideal flow path through the cyclone should be a continuous spiral. If product accumulates on the cyclone wall try alterations to the compressor pressure or the jet size.

7) Some samples may require pre-heating before spraying.

8) In rare instances the use of a suitably supported separating/dropping funnel positioned as near as possible to the jet assembly has been found to be effective rather than using the pump. This gravity feed method is effective where e.g. abrasive ceramics may cause the pump tube to wear exceptionally quickly.

Thank you for reading this data sheet.

For pricing or for further information, please contact us at our UK Office, using the details below.

UK Office
Keison Products,
P.O. Box 2124, Chelmsford, Essex, CM1 3UP, England.
Tel: +44 (0)1245 600560
Fax: +44 (0)1245 808399
Email: sales@keison.co.uk

Please note - Product designs and specifications are subject to change without notice. The user is responsible for determining the suitability of this product.